Original Research

Increased rates of illness and death from asthma in Canada

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Recent rates of illness and death from asthma in Canada and rates of hospital admission/separation for asthma were examined by age group and region. The death rates were higher in 1982–84 than in 1970–72, especially among those aged 15 to 34 years. Increases were also noted in hospital admission/separation rates, especially among those less than 15 years of age. Hospital admission/separation rates were highest in the Maritime provinces and Saskatchewan, whereas death rates were highest in Alberta and Saskatchewan. Examination of death certificates for coding errors and recoding of certificates to a single (8th) revision of the International Classification of Diseases indicated that changes in disease coding and errors in coding did not account for the significant increase in rates of death from asthma for those aged 15 to 34 years. These increases in rates of illness and death from asthma are unexplained and warrant further investigation.

Étude de l'asthme au Canada sous le rapport de la morbidité, de la mortalité et du taux d'hospitalisation ou de sortie, selon l'âge et la région. La mortalité est plus élevée en 1982–84 qu'en 1970–72, surtout aux âges de 15 à 34 ans. Cette augmentation significative persiste après correction des certificats de décès à la lumière de la Classification internationale des maladies (8e révision). La mortalité est le plus forte en Alberta et en Saskatchewan. Les taux d'hospitalisation ou de sortie ont aussi augmenté, surtout avant 15 ans; ils sont le plus élevés dans les Provinces maritimes et en Saskatchewan. Ces aggravations inexpliquées dans la morbidité et la mortalité de l'asthme demandent une étude plus poussée.

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The Canada Health Survey (1978–79) produced evidence that over half a million Canadians have asthma.[1] Despite the importance of asthma as a cause of illness, disability and premature death, relatively few epidemiologic studies of causal or aggravating factors have appeared in the literature.

An epidemic of deaths from asthma occurred in Great Britain, Australia and New Zealand during the 1960s.[2–4] While this epidemic abated during the 1970s, there is fresh evidence that rates of both illness and death from asthma are once again climbing. A recent report indicated that rates of death from asthma in England and Wales increased by an average of almost 5% per year from 1974 to 1984 for those aged 5 to 34 years.[5] The average annual increase in hospital admission rates was 21% between 1974 and 1983 for the youngest group (less than 5 years of age). Increases in death rates in recent years have also been noted for New Zealand, the United States, Denmark and Sweden.[6–9] In this paper we examine recent Canadian trends in rates of illness and death from asthma

and address potential artefacts resulting from the change in 1979 from ICD-8[10] to ICD-9.[11]

Methods

Data on hospital admission/separation for asthma (ICD-8 and ICD-9 code 493) were provided by the Health Division of Statistics Canada for 1970 through fiscal year 1982–83. Each admission/separation represents one continuous stay in hospital by one person. Thus, one person may have more than one separation per year.

Mortality data for Canada for 1970–84 were provided by the Health Division of Statistics Canada. Data on the smoking habits of Canadians were provided by the Tobacco Products Unit of the Department of National Health and Welfare.

Standardized mortality ratios (SMRs) were calculated. An SMR is the ratio of the number of deaths observed in the study population to the number expected if the study population had experienced the same age- and sex-specific death rates as a standard population. For our study we calculated expected numbers of deaths using rates of death from asthma in Canada in 1970–72. The statistical significance of the SMRs was tested by means of a Poisson ratio test.[12] Age-standardized death rates were based on the 1971 Canadian population as a standard.

The Nosology Reference Centre of Statistics Canada examined the death certificates for all people aged 15 to 34 years who died of asthma between 1970 and 1985 as well as the certificates of a sample of 25% of those who died of respiratory disease other than asthma (ICD codes 460 to 492 and 494 to 519). The certificates were checked to determine whether the appropriate rules had been used in assigning underlying causes of death and were then recoded, when necessary, to ICD-8.

Results

The rates of hospital admission/separation for asthma increased by over 50% for both sexes

Table I — Rates of hospital admission/separation for asthma per 100 000 population in Canada* in 1970–72 and 1980–82, by age group

	Rate					
	Males			Females		
Age, yr	1970–72	1980–82	% change	1970–72	1980–82	% change
< 1	293	848	189	142	397	180
1–4	414	1123	171	229	614	168
5–14	173	350	102	111	246	122
15–24	42	67	60	71	119	68
25–34	36	41	14	73	89	22
35–44	63	61	−3	108	120	11
45–64	173	163	−6	193	218	13
65–74	347	336	−3	251	325	29
≥ 75	312	343	10	162	277	71
All	147	224	52	130	205	58

*Excluding the territories.

Table II — Rates of hospital admission/separation for asthma per 100 000 population in Canada in 1970–72 and 1980–82, by province

	Rate					
	Males			Females		
Province	1970–72	1980–82	% change	1970–72	1980–82	% change
British Columbia	180	217	21	158	207	31
Alberta	193	252	31	166	240	45
Saskatchewan	334	352	5	251	294	17
Manitoba	163	224	37	144	205	42
Ontario	147	227	54	134	214	60
Quebec	87	156	79	84	133	58
New Brunswick	155	305	97	137	291	112
Nova Scotia	159	337	112	146	311	113
Prince Edward Island	341	607	78	247	494	100
Newfoundland	166	272	64	128	246	92

between 1970–72 and 1980–82. The largest increases occurred among those aged less than 25 years, particularly those below age 15 (Table I). Increases were highest in the Maritime provinces. Rates in 1980–82 were highest in these provinces and in Saskatchewan (Table II).

Rates of death from asthma increased by 9% for males and 44% for females between 1970–72 and 1982–84 (Table III). Dramatic increases were noted among those aged 15 to 24 and 25 to 34 years; these increases were not restricted to any one province. While all regions experienced increased rates of death from asthma among people aged 15 to 34 years, by far the largest increases were noted for Alberta and Saskatchewan (Table IV).

The results of recoding death certificates to ICD-8 are shown in Table V. Rates of death from asthma, although lower after recoding, were still significantly higher in 1982–84 than in 1970–72. Only 11 of 534 deaths were incorrectly coded as being due to asthma. None of the 574 deaths attributed to respiratory disease other than asthma were considered to have been from asthma. Of the 265 deaths attributed to asthma between 1979 and 1985 with ICD-9, 8 would have been coded as being due to other causes of death with ICD-8.

Discussion

Rates of hospital admission/separation for asthma and rates of death from asthma have increased dramatically among children and young

Table III — Age-standardized rates of death from asthma per 100 000 population in Canada in 1970–72 and 1982–84

	Rate (and no. of deaths)					
	Males			Females		
Age, yr	1970–72	1982–84	% change	1970–72	1982–84	% change
< 1	0.36 (2)	0.00 (0)	−100	0.00 (0)	0.00 (0)	0
1–4	0.22 (5)	0.04 (1)	−82	0.09 (2)	0.00 (0)	−100
5–14	0.17 (12)	0.19 (11)	12	0.15 (10)	0.20 (11)	33
15–24	0.13 (8)	0.57 (40)	338	0.30 (18)	0.78 (52)	160
25–34	0.27 (12)	0.49 (32)	81	0.21 (9)	0.52 (34)	148
35–44	0.65 (25)	0.74 (35)	14	0.78 (29)	0.78 (37)	0
45–54	1.47 (50)	1.71 (65)	16	1.75 (61)	1.77 (68)	1
55–64	3.76 (96)	3.27 (107)	−13	2.59 (68)	4.14 (147)	60
65–74	10.75 (161)	8.58 (180)	−20	6.22 (108)	7.90 (202)	27
≥ 75	15.18 (127)	20.60 (220)	36	8.81 (103)	14.59 (264)	66
All	1.64 (498)	1.79 (691)	9	1.18 (408)	1.70 (815)	44

Table IV — Standardized mortality ratios (SMRs) for people aged 15 to 34 years in Canada in 1973–78 and 1979–84

	1973–78			1979–84		
Province or territory	Observed no. of deaths	Expected no. of deaths*	SMR	Observed no. of deaths	Expected no. of deaths	SMR
Yukon Territory	0	0.12	0.00	1	0.13	7.56
Northwest Territories	0	0.21	0.00	0	0.26	0.00
British Columbia	14	11.43	1.23	29	13.29	2.18‡
Alberta	20	9.03	2.22	47	12.34	3.81‡
Saskatchewan	6	3.93	1.53	15	4.56	3.29‡
Manitoba	5	4.62	1.08	10	4.90	2.04
Ontario	67	38.32	1.75‡	78	41.89	1.86‡
Quebec	35	30.88	1.13	79	32.70	2.42‡
New Brunswick	3	3.16	0.95	7	3.47	2.02
Nova Scotia	10	3.81	2.63†	8	4.16	1.92
Prince Edward Island	1	0.52	1.92	2	0.58	3.44
Newfoundland	1	2.61	0.38	3	2.86	1.03
Total	162	108.64	1.49‡	279	121.14	2.30‡

*Based on rates of death from asthma in Canada in 1970–72.
†$p < 0.05$ by Poisson ratio test.[12]
‡$p < 0.01$.

adults during recent years in Canada. The largest relative increases in hospital admission/separation rates occurred among those under age 5 years. This finding has also been reported for England and Wales, where rates of hospital admission for asthma for this age group increased by an average of 21% per annum between 1973 and 1983.[5] The US National Hospital Discharge Surveys revealed that rates of hospital separation for asthma for children under 15 years of age increased by 145% from 1970 to 1984.[13]

People aged 15 to 34 years accounted for the largest increases in death rates. This finding is consistent with that noted for England and Wales: the largest increase occurred among those aged 5 to 34 years.[5]

These increases could be artefacts due to changes in access to health care, diagnostic criteria, hospital admission practices or disease coding. Universal health care was introduced before 1969 in Canada, and the diagnosis of asthma, which poses problems among the very young and the very old, is relatively straightforward in the age group with the largest increase in death rates (15 to 34 years). A recent review by the British Thoracic Association[14] of deaths coded as being caused by asthma revealed that for those aged 15 to 44 years 90% were valid diagnoses.

In 1979 the use of ICD-9 was generally adopted. Under ICD-8, deaths from asthma in which there was mention of bronchitis (acute, chronic or unspecified), bronchiolitis or emphysema were attributable to these other conditions. Under ICD-9 these deaths would have been attributed to asthma. We found that of the 265 deaths from asthma among those aged 15 to 34 years recorded under ICD-9 (1979 to 1985), only 8 would not have been coded as being due to asthma under ICD-8. The large increase in rates of death from asthma in this age group is not explained by changes in disease coding.

Table V — Rates of death from asthma per million population for people aged 15 to 34 years based on uncorrected* and corrected† coding of the International Classification of Diseases (ICD)

Year	Rate (and no. of deaths)	
	Uncorrected coding	Corrected coding
1970	2.1 (14)	2.1 (14)
1971	2.2 (15)	2.0 (14)
1972	2.5 (18)	2.4 (17)
1973	2.3 (17)	2.3 (17)
1974	4.0 (31)	3.8 (29)
1975	3.4 (27)	3.4 (26)
1976	4.0 (32)	4.0 (32)
1977	4.0 (33)	4.0 (33)
1978	2.6 (22)	2.4 (20)
1979	3.4 (29)	3.3 (28)
1980	5.3 (46)	4.7 (41)
1981	5.2 (46)	5.0 (44)
1982	6.0 (53)	6.0 (53)
1983	6.3 (56)	6.2 (55)
1984	5.5 (49)	5.2 (46)
1985	4.7 (42)	4.6 (41)

*Coded to ICD-8[10] (1970–78) and ICD–9[11] (1979–85).
†Coded to ICD–8 only.

The US National Center for Health Statistics estimated that the change in ICD revisions resulted in an artefactual increase of 35% in rates of death from asthma for all ages.[15] On the basis of the bridge-coding exercise performed by the British Office for Population Censuses and Surveys, the effect of changing from ICD-8 to ICD-9 was an increase of 28% in the number of deaths from asthma for all age groups.[16] However, the increase for those aged 15 to 44 years was only 6%. Sweden and Denmark, which continued to use ICD-8, also experienced increased rates of death from asthma.[9]

Alternative explanations include a change in the natural history or severity of asthma and an actual increase in the incidence of the condition. The prevalence rate of asthma among young children in Montreal apparently increased from 3.8% to 6.4% in just 2 years (from 1981 to 1983).[17] The increase could not be explained by changes in diagnosis and treatment, access to health care or disease coding. Data from the US National Health Interview Survey indicated that the prevalence of asthma among children 6 to 16 years of age increased by 28% from 1970 to 1980.[13] An increase in the prevalence of asthma among children has also been reported from New Zealand.[8]

The importance of environmental factors that aggravate or precipitate asthma may have increased during the 1970s. For example, tobacco smoke aggravates asthma.[18] The prevalence of smoking among men and women 25 to 44 years of age declined slightly during the 1970s, but the average number of cigarettes smoked per smoker per day increased by over 50% among women 24 to 34 years of age between 1969 and 1981 (Neil E. Collishaw, Tobacco Products Unit, Department of National Health and Welfare, Ottawa: unpublished data, 1986). These women would have included many of the mothers of children under age 15, the age range for which hospital admission/separation rates increased the most. Other hypothesized risk factors include overreliance on bronchodilators[19] and sporadic use of these devices.[20]

The increased rates of death due to asthma among people 15 to 34 years of age and the increased hospital admission/separation rates for those under 5 years of age are unexplained and warrant further investigation. There were 154 deaths due to asthma among those aged 15 to 34 years during 1982–84, compared with only 45 in 1970–72. Possible nonartefactual explanations include increased incidence rates and increased case-fatality rates. In turn, such changes could be due to increased exposure to environmental factors that precipitate or aggravate asthmatic attacks, such as food additives (e.g., sulfites), or to changes in the use of antiasthma drugs.

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